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10 How to Use Lessons Learned in Rebuilding Infrastructure and Cleaning the Environment

Chapters 5 through 9 clearly demonstrate the significance of understanding and using the many lessons learned from past mistakes and scandals. They further demonstrate that proper introduction and use of the IPQMS methodology will restore accountability, cost effectiveness, and quality in all programs and projects.

An IPQMS case history data base should be generated for both private and public sectors. The guidelines and checklists developed from the case histories will serve to eliminate waste, fraud, and mismanagement once and for all. Of equal importance, these guidelines and checklists will also prevent disasters such as the spacecraft Challenger disaster in January 1986.

This chapter shows how to use the IPQMS to plan, design, and implement the rebuilding of America's infrastructure and cleaning up the environment. The primary focus will be on a training program in each of the 50 states for the planners, designers, and managers.

10.1 A \$35 BILLION PROGRAM TO REPAIR INFRASTRUCTURE AND CLEAN UP THE ENVIRONMENT

[Chapter 1](#) emphasized the serious state of the nation's infrastructure, the impact it has on the quality of life, and the impact it has on the nation's economy. Without continuous investments in infrastructure, a modern economy fails to grow.

Our research shows that \$35 billion every year for 10 years will create 1 million jobs to rebuild the nation's decaying infrastructure and clean up the contaminated environment. This amount would pay an average salary of \$25,000 per year plus \$5,000 for fringe benefits per worker. There would be

an additional \$5,000 for the necessary IPQMS training for the professional planners, designers, and managers. It is emphasized that the \$35 billion per year is only for the manpower requirements and will come from federal sources. The funds for materials and equipment to be used could come from existing federal budgets for infrastructure, such as the recently enacted Transportation Equity Act, popularly known as TEA-21. This provides \$216 billion from 1999 to 2004.

Each state would also administer the necessary job training on a partnership basis with both the federal Department of Transportation (DOT) and the Environmental Protection Agency (EPA) to oversee the monumental rebuilding (repairs and retrofit) of highways and bridges, airports, water supply and waste disposal systems, and other public facilities such as schools.

The \$35 billion from the federal government could come from \$20 billion in the Defense Peace Dividend, \$10 billion from Corporate Welfare, and \$5 billion in Social Welfare savings. An alternative could be to take the entire \$35 billion from Corporate Welfare. Congressional records show that these amounts are attainable.

Why infrastructure and the environment? There is a vital link between infrastructure investment and the nation's productivity and competitiveness. National organizations involving contractors, engineers, architects, and state/county officials have been warning Congress and the White House since the early 1980s about the dire consequences of substandard infrastructure. In a report released in March 1998, the American Society of Civil Engineers (ASCE) gave the nation's infrastructure an overall average grade of D and said it would take more than \$1 trillion — as a public-private partnership — to fix the long-neglected problems. There are supposed to be trust funds to maintain highways and airports and waterways, but the funds for these purposes have been diverted in the past.

There is also a link between capital investment in infrastructure and quality of life. When public health becomes an issue, we must combine investment in infrastructure with investment in cleaning up the nation's worst hazardous waste sites. EPA's track record in cleaning up toxic waste sites through Superfund programs ([Chapter 8](#)) has not been successful. The environment has been worsened, as discoveries are made, by the illegal dumping of nuclear wastes from Cold War bomb factories across the nation.

Past studies indicate the rebuilding of our infrastructure will take at least 10 years, most probably longer. In addition, a maintenance budget of around 15 percent of the cost to rebuild should be set aside for the purpose, every year.

Aside from rebuilding the infrastructure, the infusion of 1 million jobs to the economy will increase federal receipts from the expanded tax base. It

will result in benefits regarding (1) public health in general, and (2) saving industry at least \$30 billion annually in avoiding detours from unsafe bridges and roadways.

Another benefit, possibly the greatest one, is the opportunity to plan, design, implement, and manage the 1 million jobs using the IPQMS. Experience with the IPQMS shows it ensures teamwork, accountability, and cost effectiveness. Thus, it eliminates waste, fraud, abuse, and mismanagement. A cost-effective program will be ensured by a combination of job training and overall management in the IPQMS framework.

10.2 THE IPQMS ERA HAS ARRIVED

Rebuilding our deteriorating infrastructure calls for new approaches that transcend disciplinary boundaries, thus promoting teamwork and accountability.

The IPQMS provides a dynamic and holistic approach to management which considers the entire range of a program or project's activities, from planning through implementation, evaluation and refinement, with the central function of policy providing focus and direction throughout the life of the project. Thus, it serves as a basis for integrating (instead of fragmenting and compartmentalizing) and organizing all project teams to provide the necessary leadership, teamwork, and information flows for cost effectiveness, efficiency, and safety — ingredients necessary for accountability and total quality. Of equal importance, it provides the framework for improved project management, education, and training.

The IPQMS is effective for engineering and public works projects where various components and stages are well defined. Checklists corresponding to each of the components are prepared in detail and are evaluated at any time during the cycle. The IPQMS can also be used in other areas such as agriculture, defense, environmental protection — and indeed, in various other aspects of government and the private sector.

The IPQMS is a powerful management tool that provides solutions to complex problems of people, organizations, finance, materials, and time — facilitating decision-making and eliminating problems that might arise during implementation. With the advent of very efficient computer systems, the IPQMS becomes doubly easy to adopt. Warning indicators can be introduced so that projects, when something goes wrong, can be corrected in time. Graft, or overspending, can be pinpointed in all areas, and waste can be minimized. Mismanagement will be identified as soon as it happens and thus curtailed. An IPQMS-run project is a fail-safe project. Thus, an IPQMS-run project, from conception through completion, will avoid litigation.

10.3 OUTLINE FOR IPQMS SEMINAR COURSE

The senior author has extensive experience in planning and conducting training programs for senior scholars and practitioners on the use of the IPQMS methodology for public works projects. The authors, with a colleague, designed a training program for the EPA Superfund program in 1993 to (1) initiate a data base of IPQMS case histories of six NPL sites cleaned up, and (2) provide scientific guidelines from the initial data base for cleaning up the remaining 1300± NPL sites.

With this background, an outline for an IPQMS seminar course has been designed. It is shown below, designed as a weekly seminar course to introduce the IPQMS as a new model to optimize available resources for accountability, cost effectiveness, and quality. Useful lessons to improve the process of planning, design, implementation, and management are drawn from post-mortems of past programs and projects. Group term papers are required to encourage teamwork and provide hands-on experience with the IPQMS methodology, case histories, guidelines, and checklists. This book would be used for the training program. Prerequisites for this course are an undergraduate degree in engineering, architecture, business administration, public administration or economics, and approval from the instructor.

10.4 INTENSIVE TWO-WEEK TRAINING PROGRAM FOR PLANNERS, DESIGNERS, AND MANAGERS

The foregoing semester course can be readily adapted to an intensive 2 week training program for the various state agencies concerned with infrastructure and the environment. The first year of the \$35 billion rebuilding program will focus on the Departments of Transportation. The second year focus will be on the Departments of Environmental Protection (names vary from state to state). The training cycle repeats itself during the 10 year program to ensure an adequate reservoir of IPQMS trained planners, designers, and managers.

The trainers would be senior scholars and practitioners who are qualified to introduce the IPQMS as a new model to ensure accountability, cost effectiveness, and quality.

10.4.1 FOR DEPARTMENTS OF TRANSPORTATION

Each state DOT would select 20 participants for the training program. They would be persons at the middle-management level who would be trained in the use of the IPQMS methodology for rebuilding the infrastructure in their respective states. This means they must have the necessary qualifications to

Seminar Meeting	Topic For Discussion	Reading Assignments
1.	Introduction to the IPQMS: What it is and what it can do	Chapter 2
2.	How to use the IPQMS	Chapter 3
3.	Significance of IPQMS Cases Case histories by phase Significance of feasibility studies Term paper proposals	Chapter 4
4.	Lessons learned from cases Assignment of project teams for term papers (term paper topics must be approved by instructor)	Chapter 5
5.	Project accountability and evaluation Format for term papers	Chapter 4
6.	Library research for term papers	
7.	Open discussion of term papers Assignment of progress reports for next meeting	Chapter 6
8.	Progress reports Discussion of potential problems	
9.	Individual team meetings on term projects Open discussion	
10.	Application of evaluation to refinement of planning phase IPQMS checklists	Chapters 7 and 8 Appendix B
11.	Term paper progress reports	
12.	Troubleshooting problem areas IPQMS cases as a data base	Chapter 9
13.	Final library research with instructor Individual team meetings	
14.	First drafts of term papers due	
15.	Final examination: Presentation of term papers by project teams Final typing of term papers due	

assume project management positions upon completion of the training program.

The training program has been designed to be conducted 5 days a week for 2 weeks. The following program outline is based on lectures/discussions between 9 a.m. and 12 noon each day, with afternoons generally devoted to individual reading plus team (three to four participants per team) research and discussion. The trainers will be available for discussion and consultation

each afternoon. Each participant will be requested to bring in a project he or she has worked on to provide a basis for selecting the course team paper research and writing requirement.

The participants will be given reading assignments on the first day of the course, and the literature on the various case histories. Readings shall be done prior to scheduled dates for case discussion.

10.4.2 POSSIBLE PROBLEM TOPICS BROUGHT IN BY TRAINEES TO THE TRAINING PROGRAMS

The trainees will be asked to bring with them specific problem topics that they encounter in their respective agencies. Using the IPQMS and working in teams, by the end of the training solutions will be offered so that the trainees will find their stay relevant to their work.

For example, take the case of a certain state Department of Transportation's desire to minimize cost overruns on each construction contract that is administered. A study to investigate and identify those factors that significantly impact construction cost overruns could be undertaken by the class. The trainees could be asked to bring pertinent data relating to the number of projects during a certain period, project size, project type, level of competition (measured by the number of bids and the range of those bids), geographical district, pre-contract engineering, and frequency with which a contractor is awarded contracts. The data would also include statistical analysis of each project pertaining to design, bidding, and construction administration data. Conclusions on the occurrence of cost overruns would be drawn; thus, the trainees shall be made aware of such pitfalls and could thus avoid them in future work situations.

Some project problems may be more difficult than others; however, they could be analyzed and solved by the IPQMS methodology. Other projects involve relatively higher degrees of technical, environmental, cultural, and sociological complexity. Using the IPQMS step-by-step in more complex problems will enable the participants to appreciate the simplicity of the methodology.

10.5 CONCLUSIONS

Lessons from the IPQMS postmortems show two common threads — lack of accountability and lack of teamwork. Teamwork is beginning to receive attention today, but not accountability. Clearly, it is a management issue which must be addressed. The IPQMS fills that need. This represents a major contribution to the literature.

Sample Format For Two-Week Training Program

First Day (This could start on a Monday)

9:00 – 12:00	Introduction and overview of training course What is the IPQMS?
12:00	Lunch
1:30 – 3:00	Case History Method vis-à-vis Case Study
3:00 – 4:00	Readings and consultation ^a

Second Day

9:00 – 12:00	Participant presentations — planning, design and implementation problems in various agencies they represent
12:00	Lunch
1:30 – 3:00	Participant presentation — Continued Discussion
3:00 – 4:00	Readings and consultation
6:00 – 9:00	Social Hour and Dinner

Third Day

9:00 – 12:00	Participant presentations and open discussion Organization of various project teams to divide the participants
12:00	Lunch
1:30 – 3:00	Team meetings
3:00 – 4:00	Readings and consultation

Fourth Day

9:00 – 12:00	IPQMS — Lectures/Discussions on the elements involved in various phases of the IPQMS
12:00	Lunch
1:30 – 3:00	Discussion of the Trans-Alaska Pipeline case in the context of IPQMS Phase 1 Team discussions on the significance of feasibility studies
3:00 – 4:00	Readings and consultation

Fifth Day

9:00 – 12:00	IPQMS Phase 2: Team discussions of WPPSS Nuclear Power Plant projects
12:00	Lunch
1:30 – 3:00	Review all stages of WPPSS projects (Note: trainers available for consultation Saturday a.m.)

Sixth Day (After the Weekend)

9:00 – 12:00	IPQMS Phase 3: Team discussions
12:00	Lunch

1:30 – 3:00	Discussion of the EPA Superfund Program and Challenger Disaster in the context of IPQMS Phase 3
3:00 – 4:00	Readings and consultation

Seventh Day

9:00 – 12:00	IPQMS Phase 4: Team Presentations Open discussion
12:00	Lunch
1:30– 3:00	Discussion of Hanford Nuclear Reservation Case in the context of IPQMS Phase 4
3:00 – 4:00	Readings and consultation

Eighth Day

9:00 – 10:30	Lectures and discussion of impact analysis of projects
10:30 – 12:00	How to prepare case histories: Lecture and discussion
12:00	Lunch
1:30 – 3:00	Outline preparation of case histories related to the participants' projects in various agencies: Team presentations
3:00 – 4:00	Readings and consultation

Ninth Day

9:00 – 12:00	Group (team) reports and open discussion on the use of the IPQMS in respective agencies
12:00	Lunch
1:30 – 4:00	Group working sessions on preparing IPQMS checklists and guidelines

Tenth Day

9:00 – 12:00	Summary of highlights of training program by trainers Open discussion on role of policy in decision making Ethical issues, accountability and teamwork
12:00	Lunch
1:30 – 3:00	Need for an IPQMS data base in public works projects

- a. Reading assignments will be taken from the semester program.

Rebuilding our crumbling infrastructure and cleaning up our contaminated environment calls for new approaches that transcend disciplinary boundaries. The IPQMS provides such an approach, resulting in the necessary teamwork from planners, engineers, scientists, managers, and politicians. Thus, this new methodology will ensure accountability, cost effectiveness, and quality.

The IPQMS fills a long overdue need to integrate project planning, design, implementation, and management which results in unified control of all phases and tasks in programs and projects in all sectors. Experience with

the IPQMS shows this methodology will result in annual savings of \$60 billion in the construction industry alone (based on 1996 estimates).

There is need for an IPQMS data base in every sector of industry and government to complete quality projects on time and within budget. The IPQMS will also prevent future disasters such as the spacecraft Challenger, rebuilding/hazard mitigation after natural disasters (Hurricane Hugo in 1989, Loma Prieta Earthquake in 1989, Hurricane Andrew in 1992, etc.). This methodology was used in the rebuilding of the island of Kauai after Hurricane Iniki in 1992.

The IPQMS has been designed and refined to be adapted to all sectors, public and private. Thus, it can be used in training programs and projects in agriculture, education, government, healthcare, and power (energy). In government, it will eliminate waste, fraud, and mismanagement once and for all.

There is also urgent need to introduce ethics, accountability, and teamwork into all aspects of the curriculum in professional schools across the country. This will initiate the long overdue process of producing cadres of young professionals who understand the benefits of teamwork and maintaining high ethical standards.